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(54) Electric cables

(57) Inexpensive cables with useful fire-survival characteristics are insulated with cross-linked polyethylene or a cross-linked ethylene/vinyl acetate copolymer and sheathed with a heavily mineral-filled ethylene/propylene/diene terpolymer compound

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SPECIFICATION

Electric cabl s

Many kinds of electric cable demand the use of organic insulating material. Materials that are sufficiently flame-retardant not to take fire on application of a small flame or an electric arc have been available for many years and are widely used, but some of these will ignite and burn vigorously if sufficiently pre-heated by exposure to an existing fire, and others are liable to be destroyed by pyrolysis under fire conditions, leading to short circuit faults.

Cables that will continue to function for a reasonable length of time during and after exposure to a fire have been made, for example with silicone rubber insulation reinforced with glass fibre braid, for use in aircraft and in other applications where cost is not of prime concern, but there has hitherto been no inexpensive cable providing these benfits.

In accordance with the invention cables, especially control/signalling cables, are insulated with cross-linked polyethylene (XLPE) or cross-linked ethylene/vinyl acetate copolymers (XLEVA) and sheathed with a heavily mineral-filled ethylene/propylene/diene terpolymer (EPDM) compound. We have found that preferred cables of this kind can survive standard fire conditions for a period of around 20 minutes without short circuiting.

XLEVA is usually more effective for the insulation than XLPE, and the method of cross-linking needs to be carefully chosen – in most cases we prefer to use the 'Monosil' process of British Patent Application 1526398 (BICC Limited and Etabs. Maillefer S.A.) or the 'Sioplas' process of British Patent 1406680 (Dow Corning Limited; who are proprietors of the trademark 'Sioplas'). These related processes involve the grafting of silane side-chains to the polymer, followed by cross-linking by hydrolytic condensation. At least for EVA, cross-linking by irradiation is also suitable. Methods involving the use of sulphur, sulphur compounds and/or aromatic compounds are less desirable as they may increase smoke hazard and in some cases flamability, but they can be used with an adequate smoke barrier and suitable bedding and sheath.

The sheathing compound will usually contain a minimum of 40%, preferably at least 55%, of inert mineral filler, such as hydrated alumina alone or mixed with calcium carbonate and may included up to 80%. It will usually include also a plasticiser (preferably chosen to achieve low-smoke characteristics) and an antioxidant, together with a curing agent if desired.

In the case of a wire-armoured cable, a bedding of the same kind of composition based on EVA may be adopted.

Properties can be further improved by the addition of a wrapping of woven glass tape or glass reinforced mica paper tape, with or without an outer abrasion-resistant covering.

Example:

Two round copper wires each 1.38 mm in diameter and another 1.13 mm in diameter, each insulated with 0.6 mm radial thickness of radiation-crosslinked EVA compound are laid up with a 50 mm lay. An extruded bedding with a nominal wall thickness of 0.5 mm has an external diameter of about 7 mm and comprises from 20–60 parts by weight of a copolymer of 60% ethylene and 40% vinyl acetate and correspondingly from 80–40 parts by weight of a finely divided chemically basic filler which consists of one or both of alumina trihydrate and calcium carbonate, together with up to 2.5 parts by weight of conventional processing aids and antioxidant. Over this bedding is helically applied a resin-bonded glass fibre reinforced mica paper tape 0.15 mm thick and 25 mm wide with the mica side inwards and the turns overlapping. The cable is completed by an extruded outer sheath about 1.26 mm thick comprising 20–60 parts by weight of an EPDM, such as those sold under the trademarks Keltan, Nordel and Vistalon, correspondingly 80–40 parts by weight of a finely divided chemically basic filler consisting of one or both of alumina trihydrate and calcium carbonate and up to five parts by weight of conventional processing aids.

CLAIMS

1. An electric cable insulated with cross-linked polyethylene or a cross-linked ethylene/vinyl acetate copolymer and sheathed with a heavily mineral filled ethylene/propylene/diene terpolymer compound.

2. An electric cable insulated with polyethylene or an ethylene/vinyl acetate copolymer cross-linked (in either case) by hydrolytic condensation after the grafting of silane side-chains to the polymer and sheathed with a heavily mineral-filled ethylene/propylene/diene terpolymer compound.

3. An electric cable insulated with an ethylene/vinyl acetate copolymer cross-linked by irradiation and sheathed with a heavily mineral-filled ethylene/propylene/diene terpolymer compound.

4. A cable as claimed in any one of the preceding claims in which the terpolymer compound contains 40–80% of inert mineral filler.

5. A cable as claimed in any one of claims 1–3 in which the terpolymer compound contains 55–80% of inert mineral filler.

6. A control/signalling cable substantially as described with reference to the Example.

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